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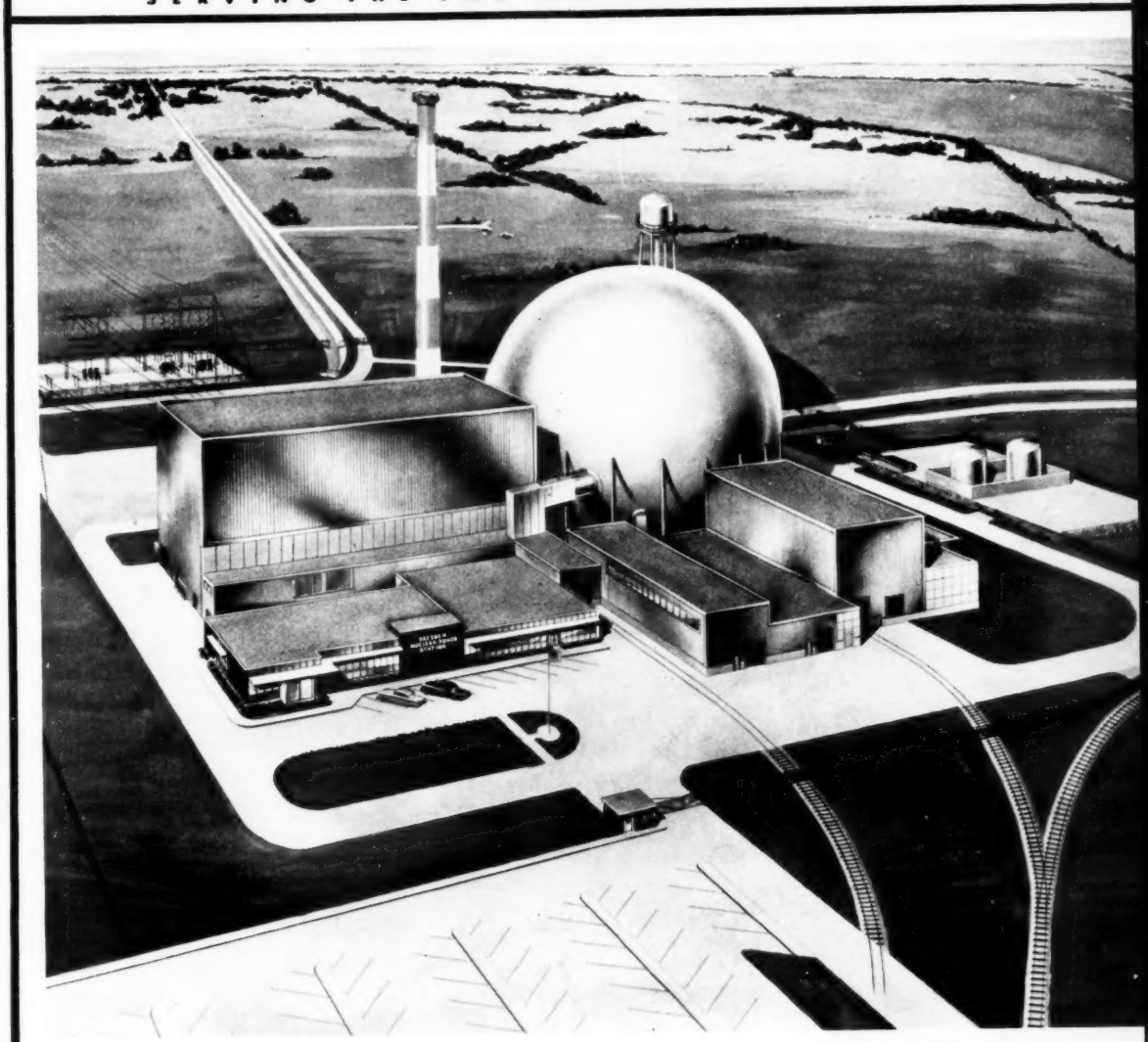

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ENGINEERING FOR MOBILITY—PAGE THREE

Vol. 9 OCTOBER, 1956 No. 5

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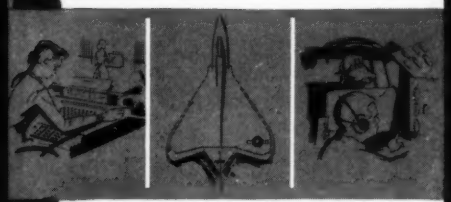

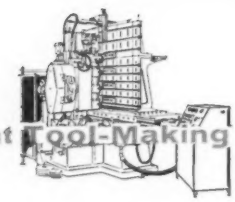

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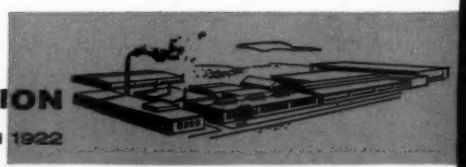

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Serving the Engineering Profession

October, 1956 Vol. 9, No. 5

CONTENTS

COVER STORY

Shown is a drawing showing the layout of the Dresden Nuclear Power Station which General Electric Company is building for Commonwealth Edison Company and the Nuclear Power Group, Inc. The nuclear reactor will be housed in a steel sphere 190 feet in diameter.

Construction work on the $45,000,000 plant will start next spring with completion set for mid-1960.

It will be located on the Illinois waterway 50 miles southwest of Chicago and become part of the Commonwealth system which will own and operate the plant.

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Engineering for Mobility

By Major General Charles G. Holle

Since the Corps of Engineers is by far the nation's oldest engineering organization, it naturally has many descendants who have left the ancestral castle. In some cases these descendants have become thriving independent engineering entities that now help to support the body.

I believe that your organization, the American Railway Engineering Association, might be included in this category. The Corps of Engineers and its personnel did much of the basic engineering for the nation's railway system. It laid out many of the early eastern lines, and as the rails crossed the Mississippi, laid out all of the great transcontinental trunk lines. It was an Army Engineer officer who built, and for a time managed, the Baltimore and Ohio Railroad. This same officer, Lt. George W. Wheeler, designed the best railway locomotive of his day and was summoned by the Czar of Russia to play a major role in Russian railway development. Up to 1855 the Army Engineers had done the surveying for almost every foot of rail laid in the United States; and after the Civil War the great majority of railway executives were former Corps of Engineers' personnel. It is perhaps for this reason that the railway construction crews in the West were organized along military lines.

Now, though we of the Corps are still vitally interested in rail transportation, and in fact do the maintenance-of-way on some 4,000 miles of our own trackage, it is not we but you who are the basic railway engineering authority. Today the Corps of Engineers bases its railway engineering upon the manuals and recommended practices of the A.R.E.A. Thus the offspring, grown strong and independent, is helping to support the parent.

The Army Engineers' century-old concern over railway development is due, of course, to the vital relationship between the needs of national defense and the capabilities of the nation's transportation systems. This relationship has many facets, some obvious, some complex. It has never been more important to national survival than it is today.

The Corps of Engineers is directly and importantly involved in the Army's problem of logistics and mobility, and hence directly concerned with the nation's railway transportation system. It is unnecessary, I believe, for me to stress in this connection the vital work of our comrades in the Transportation Corps, with whom we engineers have been proud to work on many a difficult job from the Arctic to the African deserts. But today I wish to discuss defense transportation problems from the standpoint of our common interest in construction and engineering.

In these days wars may come in all shapes and sizes; and we can deter wars of *all* kinds only if we are demonstrably capable of winning wars of all kinds. Thus our military strength, to accomplish its purposes, must be flexible and proportioned, appropriate to deter or to fight small wars as well as big wars, wars in jungles or mountains, wars in which atomic weapons are used and those in which atomic weapons are not used. As General Maxwell D. Taylor, the Army's chief of staff, said recently, "Balanced strength includes the means to put out brush fires promptly before they can spread into general war. . . . Our military planning must take into account the increasing reluctance of peace-loving people to embark on general atomic war and giving increasing attention to the constant danger of erosive efforts against weak members of the Free-Nation community."

In other words, our nation's military effort still, as always, involves ground troops and all their gear. Hence it still, as always, involves shifting men about, and hauling great quantities of machinery and equipment, and transporting the vast amounts of raw material needed to manufacture that equipment—in a word, bulk transportation in huge volume on a continental scale.

Even in peacetime, the training and deployment of our troops in the fulfillment of military missions requires tremendous use of railways and other forms of transportation. During Fiscal Year 1953 the Army alone—not counting the Navy or Air Force—originated approximately by 3,400 shipments daily, with an approximate average *daily* freight charge of more than $1 million. Its own 4,000 miles of trackage are scattered at more than 250 separate installations in independent, disconnected units ranging from a few hundred feet to more than 100 miles in length. The fact that we have switching and loading lines in such large aggregate amount is itself an indication of the great reliance of the Army on rail transport. And these peacetime figures give no conception of the use we would have to make of our railway and other transportation systems in case of even a small war.

The heart and core of our defense system is, naturally, our American homeland. Here is where we keep our reserves of strength. This is the starting-point of our supply and deployment systems. Here, as nowhere else, we need a super-efficient, expansible network of transportation systems capable of assuming on instant's notice the enormous and absolutely vital responsibilties of wartime mobility.

Mobility in the military sense has two forms—tactical and strategic. Tactical mobility is the ability to shift power on a battlefield. Strategic mobility is the ability to shift power over long distances. It includes the flow and movement of supplies.

Within the United States, railroads are the backbone of our strategic mobility. Those of you who were at work on the railways during World War II — in or out of uniform — have some

General Holle, deputy chief of engineers for construction, presented these remarks before the American Railway Engineering Association in Chicago on March 13, 1956.

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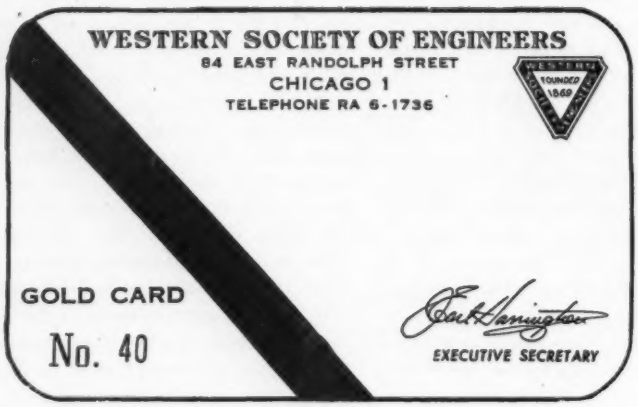

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conception of the vast scope and variety of service demanded by the Armed Forces in meeting the logistic requirements of wartime. The changes in military planning brought about by the nuclear age will in no wise diminish the need for such services and may well increase them. The tides of battle may shift with greater rapidity about the globe, requiring more movement and transport. We will no longer be able to concentrate men or equipment in congested areas and hold them there until we are ready to move them—not when a single atomic bomb-burst is capable of wiping out a whole concentration area at once. Instead, we will have to disperse our forces in small groups at scattered points, and only at the last moment transport them all together in swift and precisely coordinated multiple movements.

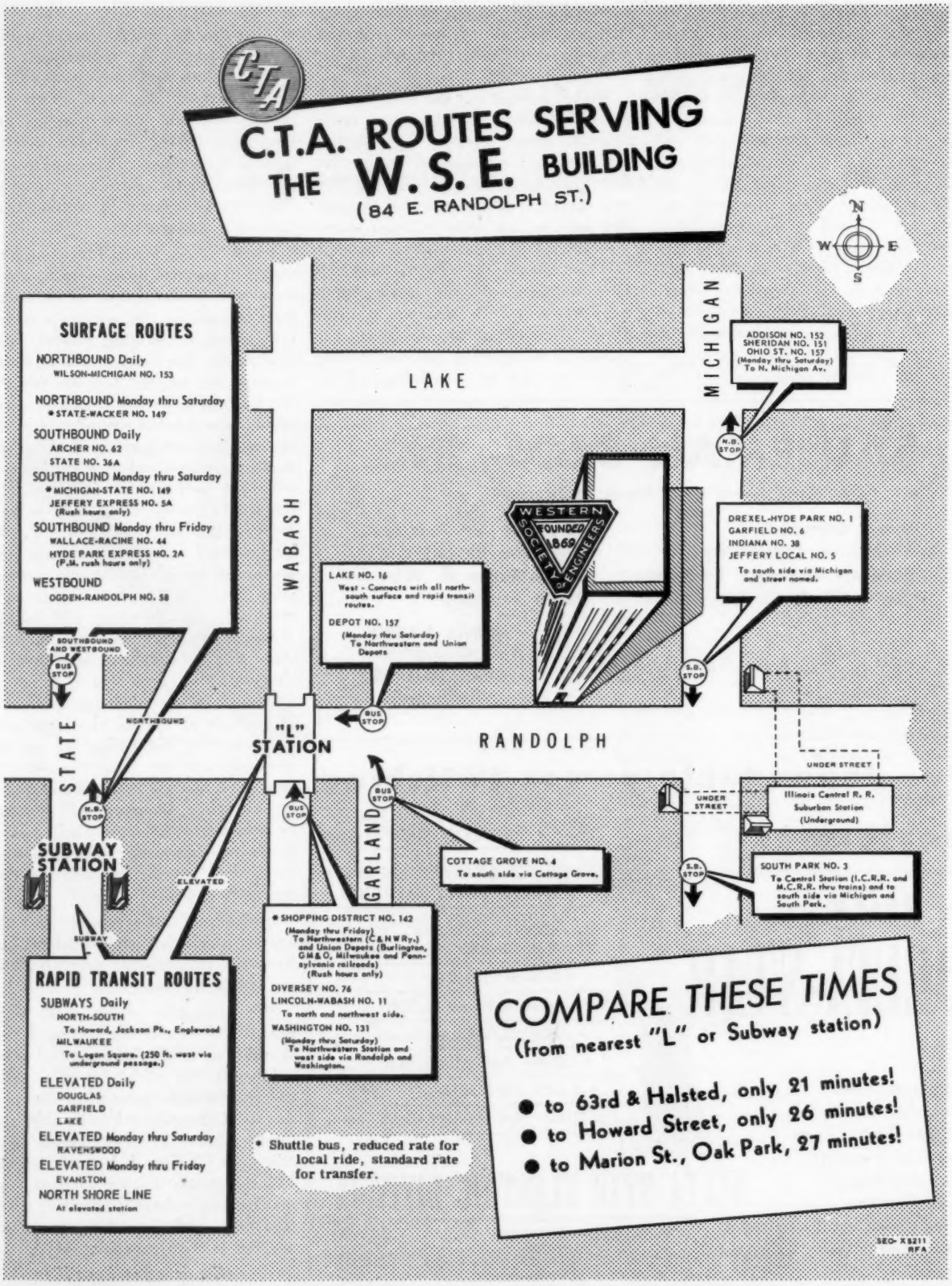
We will have to rely less on congested ports, and hence probably move more material across beaches. This applies not only to combat areas but to the loading and off-loading of vessels at our own shores. And it means that we may well have to have more railroad spurs. We will have to devise means — perhaps portable means — of bringing rail cars to shipside across beaches and exchanging cargoes with a minimum of handling. The Army is already trying out means of transporting railroad rolling stock on rails by the roll-on-roll-off method; aerial tramways to take goods across beaches; new cargo-handling methods; and similar approaches to the problem. Both the Transportation Corps and the Corps of Engineers are involved in this research. Meanwhile the railroads are making important contributions to the solution of the same general problem with such developments as the "piggy-back" method of hauling truck trailers on flatcars.

Finally, there is the little-considered matter of survival power, which, should we ever became involved in an atomic war, would be the equally-important counterpart of striking power. After two nations have struck initial atomic blows at one another, it is the side that can first get to its feet to deliver a second blow which has the advantage, and the one that can keep on standing and fighting longest which will ultimately win. The part which railways play in this ability to survive and fight back was demonstrated in World War II. We hit Germany with thousand-plane raids again and again, and always our enemies were able to move in repair equipment, and shift facilities, and keep on producing and fighting. Only after the allied Armies began to overrun their territory, and we were able to bring our fighter-bombers within range to shoot up locomotives and choke vital arteries of transportation did Germany's survival power begin to lag. After that, when we smashed a factory, it stayed smashed — reconstruction resources could no longer be brought to the spot. Their survival power no longer matched our destructive power, because they had lost their transport system.

I might add that even under the atom bombs which fell on Hiroshima and Nagasaki, railroad-type structures stood up among the best.

The destructive power of all major powers has enormously increased since World War II. It may be doubted whether the survial power of any nation has increased in proportion. But with the striking power of each side sufficiently great to do critical damage to the other—as I believe it is—it is the side with the greatest *relative* survival power that is likely to have the decisive advantage. Fully as vital as relative armaments are the relative capacities of the two

(Continued on Page 18)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Automation Offers a 30-hour Week

"The intelligent development of automation in industry will result in giving the average worker a 30-hour work week within the next five to ten years, with no reduction in pay or standard of living."

This was the prediction of Dr. Arnold O. Beckman, president of Beckman Instruments, Inc., and chairman of the Host Committee of the national technical conference and instrument exhibition of of the ISA, which opened Sept. 12 at Shrine Exposition Hall in Los Angeles. This, the 10th ISA technical conference and instrument exhibition, was the first ever to be held in the West. More than 10,000 instrumentation and automation experts from all parts of the nation were expected to attend.

"Automation is the keynote of this exposition," Dr. Beckman said. "The newest developments of leading instrument manufacturers throughout the nation will be on display and visitors to the exposition will be able to see automation in action—to see how automation will bring to mankind benefits undreamed of a few years ago.

"We should differentiate between mechanization and automation," he declared. "Simply stated, 'mechanization' replaced or amplified human brawn. 'Automation,' on the other hand, supplements the human brain. When you 'automate' a manufacturing process, you include what we call 'feed-back' or self correction. A simple example of this is the common room thermostat. The thermostat automatically controls the operation of a gas furnace, for instance, to compensate for changes in room temperature. When the room gets too warm, your thermostat turns off the furnace; when it gets too cool, it turns it on. A simple instrument thus relieves us of the necessity of remembering to read the thermometer, of deciding whether to turn the furnace on or off, and then of doing what is decided. This is automation.

"Some persons appear to be fearful of automation. They prophesy that the growth of automation will cause widespread unemployment and will work great hardship on labor," Dr. Beckman said.

"The contention that automation does not benefit human beings is absurd. As Benjamin Fairless, former chairman of the board of U. S. Steel, says, 'The facts show that only through the widest possible use of new and better machines can we hope to achieve the fullest measure of employment and a higher standard of living.' "

He pointed out that history shows that new inventions create employment. The carriage makers resisted the invention of the automobile. They said this horseless carriage would put them out of work. But, today, the automobile industry employs thousands of times more workers than did the carriage makers. In 1935 there were 408,000 workers in the automobile industry; in 1952 there were 647,000.

"There is no single example where increased mechanization, or use of auto-

mation had a long-lasting adverse effect. In 1880, the percentage of work energy supplied by mechanical power was 17 per cent, and the number of jobs in the U.S. totaled 17 million. In 1954, mechanical power supplied 95 per cent of the work energy, and there were 62 million jobs. In 1921, 500 refrigerators sold for $530 each. In 1950, the average price of the 6,200,000 electric refrigerators manufactured was $258. In spite of the introduction of the dial telephone, the number of telephone operators in this country increased by 159,000 or 79 per cent, from 1940 to 1950," he said.

Dr. Beckman points out that he believes employment should not be an end in itself. He feels there is too much emphasis today on employment for employment's sake.

"If the employee can get the same goods for less work, isn't that a better goal than just insisting that he keep the same job he has had?" he asked.

"Every change in our economic life causes a shift in the nature of employment. Job opportunities are constantly changing. Automation, like other technological developments, may reduce employment needs, at least temporarily, in certain types of jobs—but it will create many more new job opportunities than it will destroy.

"Automation not only will produce more jobs, it will bring about an upgrading of employees, which will benefit labor at all levels of technical skill. By enabling a worker to produce more, higher levels of income are made possible. Through automation jobs become easier, less tiring, more satisfying," Dr. Beckman declared.

"As a matter of fact, automation already has produced more jobs than can now be filled with available personnel. There is a crying need today for literally thousands of skilled and semi-skilled workers to produce and operate the instruments needed for automation. No man need fear for a job if he is willing to adapt himself to the needs of the day and take advantage of the innumerable opportunities for new and better jobs which automation is creating.

"Intelligent labor leaders recognize this fact and do not foolishly fight against the inevitable progress of technological improvement. On the contrary, they welcome the increase in the standard of living, reduction in the hours of toil, and other benefits which these improvements bring about," he said.

Dr. Beckman pointed out that Walter Reuther, CIO president, said before the Executives Club in Chicago, last May 13:

"If I had time to tell you what is happening in terms of automation, you would be amazed. We now manufacture and machine an engine block without a single human hand touching it, in 14.6 minutes. There are radio plants in the East where the assembly lines are automated, where two workers turn out 1,000 radio sets in eight hours when it used to take two to three hundred. We welcome automation. We believe that the more progress we can make in improving the tools of production so that we can create greater and greater economic wealth with less and less human effort, that this is desirable, but we need to find a way to gear that greater production to the needs and the hopes and aspirations of the great mass of people . . . "

"This is precisely the point I wish to emphasize," Dr. Beckman declared.

"Automation is still in its infancy," he continued. "Despite the tremendous strides which have been made in the years since the war, new inventions foreshadow developments in automation that stagger the imagination. As an example, take the transistor. This device, which replaces an electronic tube and which

already has revolutionized the hearing aid industry, is just beginning to be used in other fields of electronics, such as radio and TV. Applications to date in instrumentation for automation have been negligible.

"This year the cost of transistors probably will go below the cost of comparable electronic tubes as the result of mass production. Transistors will provide many benefits to automation instrumentation—such as greater reliability of operation, lower power requirement, and miniaturization. It is not unreasonable to anticipate that the transistor will revolutionize instrumentation for automation, just as it has revolutionized hearing aids," Dr. Beckman said.

ARBA Road Show to be Staged

The 1957 ARBA Road Show, staged again after a nine-year recess, will focus attention once more on the vital role which equipment plays in roadbuilding. The American Road Builders Association are holding their convention and Road Show in Chicago from Jan. 28 to Feb. 2.

There have been impressive developments in construction machinery since 1948 and the brand new models which 250 manufacturers will exhibit at the coming exposition will indicate how quickly productivity is being boosted. It is thanks to just such progress that roadbuilding costs have been kept in line and the American people provided with good roads at a price they can afford.

Describing the rapidity with which equipment has developed, Julien R. Steelman, President, The Koehring Company, said recently:

"Fifty years ago, the typical road project was a slow-moving scene of men and mules. Today, it is a panorama of machines—big, fast and powerful.

"Fifty years ago, manual methods accounted for 95 per cent of the work on highway jobs, and power equipment handled only 5 percent. Today, almost the opposite is true."

The mechanization of the roadbuilding industry, more than any other factor, experts agree, is responsible for America's vast network of modern highways. As an editor of a popular businessmen's magazine put it:

"The men who make construction equipment have mounted a new attack on roadbuilding costs. Their weapons: highly mechanized, high-capacity machines ranging from portable road mixing plants to huge tractor-scraper combinations that move tons of dirt at the flick of a finger. Their aim: to move a maximum amount of material in a minimum amount of time with a minimum of manual labor."

Labor Costs Spark Equipment Developments

The steady rise in labor costs through the years has led contractors to demand more productive machines. Manufacturers have responded by designing equipment with more capacity, greater speed and versatility.

An expert in the equipment field recently illustrated this trend by pointing out how the horsepower of tractors, for example, has been boosted periodically to offset increased labor costs:

In 1935, operator's wages were $1.09 per hour and tractor horsepower was about 95.

By 1941, wages had increased to $1.50 per hour and horsepower was boosted to 113.

By 1948, wages had increased to $2.25 per hour and tractor horsepower was boosted to 130.

By 1955, wages had increased to $3.25 per hour and tractor horsepower was upped to 230.

The success of this attack on road-

building costs has been defined from time to time by objective leading engineers.

Two years ago, a group of cost experts in the federal Bureau of Public Roads sat down to compare 1953 costs with those of 1923. They found that if contractors were to use the same machinery and methods that they employed in 1923, highway costs of $1.00 today would top $1.90 instead. The economy and efficiency of modern equipment makes the difference—and the public reaps the benefit.

Big Projects Impossible Without Machines

Actually, without the big excavation and earthmoving machines now available to the contractor, it is doubtful that today's tough projects could be done.

Take the Massachusetts Turnpike, for example. To create this 123-mile superhighway across the Bay State, roadbuilders have had to gouge their way through ranges of rock-solid hills, shifting, in the process, nearly 40 million cubic yards of earth. To pave the turnpike, they have had to place a million tons of bituminous concrete, 1.7 million tons of crushed stone, 6 million cubic yards of gravel, 600,000 cubic yards of concrete and 60,000 tons of steel.

Contractors threw a gigantic fleet of powerful machines into this job and are finishing within a few short months a project which, without modern equipment, would have taken a decade to complete.

The development of fast pavers, automatic batching plants and untiring aggregate plants has been just as dramatic.

Who would have imagined, 20 years ago, that a 236-mile-long highway, 4-lanes wide, could be paved in one construction season! Yet, except for a short 7-mile section poured last fall, that is what has been accomplished on the Kansas Turnpike. Sixteen paving contractors "ganged up" on this job to complete it within a six-months period, and the heart of their operation, observers report, was an emphasis on assembly line methods.

On the asphaltic concrete section, one contractor ran three pavers almost side by side, in tandem, to lay three 8-foot widths at once. With this system, he was able to surface almost a mile of turnpike a day. A large fleet of trucks and a 2,000-ton-a-day asphalt plant were used to supply the pavers.

On the Portland cement concrete section, another contractor paired off two huge pavers, outside the forms, to complete one-half mile of road a day, including a 4-inch base, 1-inch sand leveling course, and 10-inch slab, 24-feet wide.

The economics of building with modern equipment has made it possible for engineers to design not only larger, but safer roads. Today, they can make deep cuts where a few years ago they would have had to build a by-pass. Engineers, knowing the capacity of the contractor's fleet, no longer go over or around an obstacle in sharp, dangerous curves, but through it. Roads can be built wider, with adequate shoulders and approach lanes. With today's machines, it is no longer necessary to scarifice safety for economy.

Under the big roadbuilding program, dozens of long-delayed projects are being launched across the nation. Contractors bidding on the new jobs will look first to their equipment fleet. One industry leader, Kenneth Lindsay, executive vice president of The Iowa Manufacturing Company, made this observation recently:

"The contractors who make the most out of the National Highway Program will be those who have learned how to manipulate equipment—how to pick the right machine for the job at hand, how to set up the most productive combinations."

Road Show Launches Big Equipment Year

The timing of the 1957 ARBA Road Show could hardly be more perfect to meet this high interest in equipment. Contractors and officials from city, county and state highway departments are vitally interested in the new machines to be displayed in Chicago's International Amphitheatre.

"No other occasion except a Road Show provides roadbuilders with the opportunity to see such a wide selection of machines," ARBA's Executive Vice-President Louis W. Prentiss says.

In the meantime, on hundreds of projects this fall, construction machines, mud-caked and operating in a cloud of dust, are tackling the tough jobs that only a few years ago required the back-breaking efforts of many men. The wonder that highway construction costs are no higher than they are is testimony to the resourcefulness and skill with which roadbuilders are throwing machines into the task. It is also testimony to the inventiveness of equipment makers through the years. The 1957 ARBA Road Show will dramatize again how far and how fast the machinery manufacturers have come in designing equipment to meet the challenge of America's need for safer, speedier highways.

"Retired Engineer, Want Job?"

Are there many or few retired engineers, or others past fifty, able and willing to take temporary jobs in engineering? Engineering Societies Personnel Service, which is the employment agency for the engineering societies, wants to know. The Board of Directors of ESPS has asked me to pose the question. Being on the retired list myself, both from the army and from active professional work, and having served as a member and chairman of the Board of ESPS, the question seems to me well worth trying to answer, says William N. Carey, secretary emeritus, ASCE.

The current shortage of engineers and scientists is a well known fact. Continuous advertising in the newspapers of metropolitan areas and the quarterly combing of our campuses emphasize the need for young engineers and scientists. The supply does not begin to meet the demand for young men in these fields. Is the shortage confined to the young men, or does it include men in older brackets in industry and government? Is it possible partially to meet today's need for engineers and scientists by temporary employment of men no longer young but willing and able to perform the required tasks? If such men are available and employers want them as temporary help, the task of trying to get employers and prospective employees together will be undertaken by ESPS.

It is realized, of course, that there are deterrents and complications in any attempt to employ older or retired engineers even temporarily on routine work. Some of the largest companies, whose engineer recruitment efforts are the most impressive, simply will not hire engineers or scientists over thirty-five. Their reasons are sound where permanency in an organization is envisaged. But temporary, day by day, or week by week, employment of men to help level off peak loads need not affect the retirement system of a company nor interfere with lines of promotion, apprenticeship jobs and other factors vital to employment planned on a permanent basis.

From the viewpoint of the older prospective employee, the fifty plus man or the Social Security beneficiary of over sixty-five, there are deterrents too. These would tend to dampen the desire to take a "by the day" or week position as a temporary helper but not an integral part of a going organization. Granting the handicaps which exist from the viewpoint of both employer and prospective older employees, it still seems reasonable that some of the shortage of engineers could be met by greater use of the older members of our profession who are now unemployed or retired.

ESPS does not now know how many of such potential employees are available. If *you* are an engineer or scientist over fifty, unemployed or retired, and if you are willing and able to take a temporary job, please tell ESPS. Send a brief letter to Engineering Societies Personnel Service, 8 West 40th St., New York 18, N. Y. Just tell us your professional branch, your specialty, your age, and refer to this article. If the response is adequate in numbers, the ESPS Board will attempt to work out a plan to bring these older engineers and scientists together with the industries needing them.

It should be borne in mind, of course, that ESPS with offices in New York, Chicago, Detroit and San Francisco continues ready to help any engineer or scientist of any age better his position or to obtain one. ESPS also continues to try to locate the particular engineer or scientist any specific employer may want. These have been the routine tasks of ESPS for more than 25 years. The proposal discussed here contemplates a special kind of placement from a yet unknown number of "prospects" fifty plus in years who still desire to help themselves and their profession in the work of the nation.

Engineering Feat is Performed in Brazil

A significant engineering feat is being performed on the New Peixoto Dam being built in Brazil, reports *Engineering News-Record* in New York.

Originally, Peixoto Dam was to have had a gravity-type curved spillway, but the deep rock and fast waters of the Rio Grande forced a change. Now Peixoto Dam has an arch section being built between two gravity concrete abutments.

Peixoto (pronounced pishoto) consists of a gravity intake dam 585 feet long on the left bank, a gravity spillway section 525 feet long on the right bank, and a 615-ft arch between, with its thrust blocks abutting the gravity dam sections.

The arch will be 220 feet high, and is being built with a radius of base circle of 255 feet; the central angle is 105 degrees at top ring.

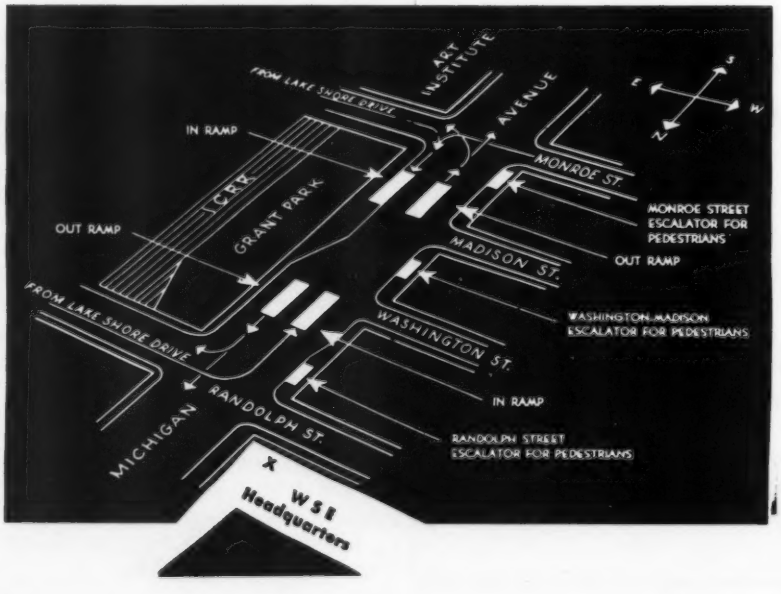
Peixoto Dam will have an ultimate installation of 400,000 kw.

SAY, ENGINEER!

Do you like to DRIVE?

Then why not drive to WSE meetings and other functions? There's plenty of PARKING almost at the door—the Underground Garage is diagonally across the street from WSE Headquarters (see the map below), two private garages are a block west, and the State-Wacker "Bird Cage" Garage is only a short distance away.

Below: map showing Park Department Underground Garage



Interior view of Underground Garage

If you're not driving it's still convenient to get to and from WSE meetings.

Here are handy stations or stops:

- The Cab Stand is just across the street
- The Elevated is one block west
- The Subway is two blocks west
- Buses stop at the door or within a few blocks for every part of town
- The IC Suburban station is across the street
- Other suburban stations are conveniently served by bus or elevated.

You see, your WSE Headquarters is at the handiest place in Chicago.

ENTER at either Monroe or Randolph Street on Michigan

EASY access, Speedy exit

ESCALATORS convey you to street level

CAPACITY The garage with its 2359 parking spaces, is designed to prevent overcrowding.

Project May Tax Dredge Capacity

The giant channel-deepening project being launched on the Great Lakes may tax the dredging industry's capacity to the utmost, declares *Engineering News-Record*.

The over-all project, involving 44,000,000 cubic yards of dredging, at an estimated cost of $150 million, calls for deepening the Great Lakes connecting channels from Lake Erie to the upper Lakes (Huron, Michigan and Superior). It was authorized in the Spring by Congress, which has appropriated $5 million to permit dredging to begin in the Detroit River this Fall, and perhaps in the St. Mary's River next Spring.

To give the dredging industry as accurate a picture of the work as possible, the dredging has been broken down into three classifications, with estimated volumes for deepening the various channels. There will be about 16,000,000 cubic yards of hydraulic dredging, with responses from the dredging contractors indicating there may be enough pipeline dredges to handle this part of the work. The major portion of the work, about 24,000,000 cubic yards, will require removal by dipper or bucket dredges. The toughest material to be removed, and fortunately the smallest in volume, is 4,000,000 cubic yards of ledge rock. Removal of this material will require heavy dredging equipment and perhaps a variety of methods.

The channel-deepening program is under the direct supervision of the Corps of Engineers' Detroit District, reporting to the North Central Division at Chicago. Charged with the responsibility of implementing and carrying out the $150 million program, Brig. Gen. Paul D. Berrigan, division engineer, has sounded an alert to the dredging industry as to the magnitude and construction timetable of the project.

In an interview with *Engineering News-Record*, General Berrigan and his chief technical assistant, Edwin W. Nelson, told the magazine that the channel-deepening program would compete strongly with the St. Lawrence Seaway for dredging capacity and equipment. (Though the project is not primarily a part of the Seaway project, basically it is vitally connected with the Seaway project.) However, there will be no premium set on speed on deepening these channels. The project is being programmed for construction at a reasonable speed, which will probably call for completion in 1962, rather than in 1959 when the Seaway is finished. In general, upbound channels will be deepened about six feet; downbound and two-way channels from two to four feet to provide minimum depths of 27 feet from Lake Erie to the upper lakes.

Lake shipping will begin to reap benefits from the deeper channels probably when the program is about half-finished—with some benefits beginning when the channels are deepened to a usable depth of 25 feet. The dredging in the various channels will have to be carefully coordinated since it is neccessary that they be kept open to traffic at all times, the magazine says.

Present plans are to take bids first on dredging the Amherstburg Channel at the lower end of the Detroit River, one of the larger jobs in the program. It will involve the removal of about 2,800.000 cubic yards of ledge rock and 1,500,000 cubic yards by dipper or bucket dredge, at an estimated cost of about $40 million, according to the magazine.

On Youth and Age

Youth is pert and positive; Age modest and doubting: so Ears of Corn when young and light, stand bold upright, but hang their Heads when weighty, full and ripe.

— Poor Richard's Almanack

Next an Air-Conditioned World?

Something akin to an air conditioned world is the next logical step for the comfort and health of the man-on-the-street.

That's the belief of D. C. Minard, president of The Trane Company, oft-quoted authority in the air conditioning field.

"Actually," Minard pointed out, "some individuals have air conditioned worlds of their own right now."

Speakers on the subject of air conditioning frequently call attention to the fact that a man can sleep in an air conditioned home, ride to and from work in an air conditioned automobile or train, work in an air conditioned office and eat in an air conditioned restaurant. He can shop in air conditioned stores and be entertained at air conditioned spots or theaters.

Minard, whose company today is regarded as an air conditioning authority in the transportation field, singled out this segment of American industry as being particularly cognizant of mushrooming air conditioning demands by the commuter.

As far as the air conditioned "world" concept is concerned, the mass transportation industry is rapidly moving to fulfill its end of the pattern, the Trane president observed.

"It is certainly only a matter of a relatively short time before all public transportation vehicles will be equipped with passenger comfort cooling," Minard noted. "An example of this evolutionary development is shown in the Hudson-Manhattan air conditioned subway car now being displayed for the first time.

"As subway cars are air conditioned, many thousands of persons will find that another important step has been taken toward their living in an air conditioned world.

"Trane currently is working hand-in-hand with major transportation concerns in testing and developing specialized air conditioning systems designed to meet specific problems. We have the equipment and test facilities to do the job they want."

Such obstacles as adjusting to rapidly changing occupant loads in subways, trains and busses, providing uninterrupted cooling while the vehicle is idling or operating at low speeds, combating the violent changes in temperature from mountains to deserts and back again, and eliminating precooling and "hot spots" in fruit and vegetable refrigeration "reefer" cars are some of the transportation air conditioning barriers torn down in recent developments, according to the chief executive.

"Currently, we have over 70 development projects under way in our Research and Testing Laboratory (The House of Weather Magic)—each directed at a particular problem, many of which are encountered in the mass transportation field," he added.

On Cunning

One man may be more cunning than another man, but not more cunning than all men.

— Poor Richard's Almanack

Cost Control Conference Features Scientific Management

Application of scientific management to cost control will be featured at a Cost Control Conference to be held at Illinois Institute of Technology, Chicago, on Dec. 6 and 7.

The conference is the ninth in a series devoted to time study, materials handling, wage incentives, work and measurement study, quality control, methods improvements, systems and procedures, and similar subjects.

It is being sponsored by Illinois Tech's industrial engineering department and National Center for Education and Research in Dynamic Equipment Policy.

More than 500 management representatives are expect to attend the meeting to be held in the IIT Commons Building at 3200 S. Wabash Ave., according to conference director Dr. Henry Ludmer, associate professor of industrial engineering.

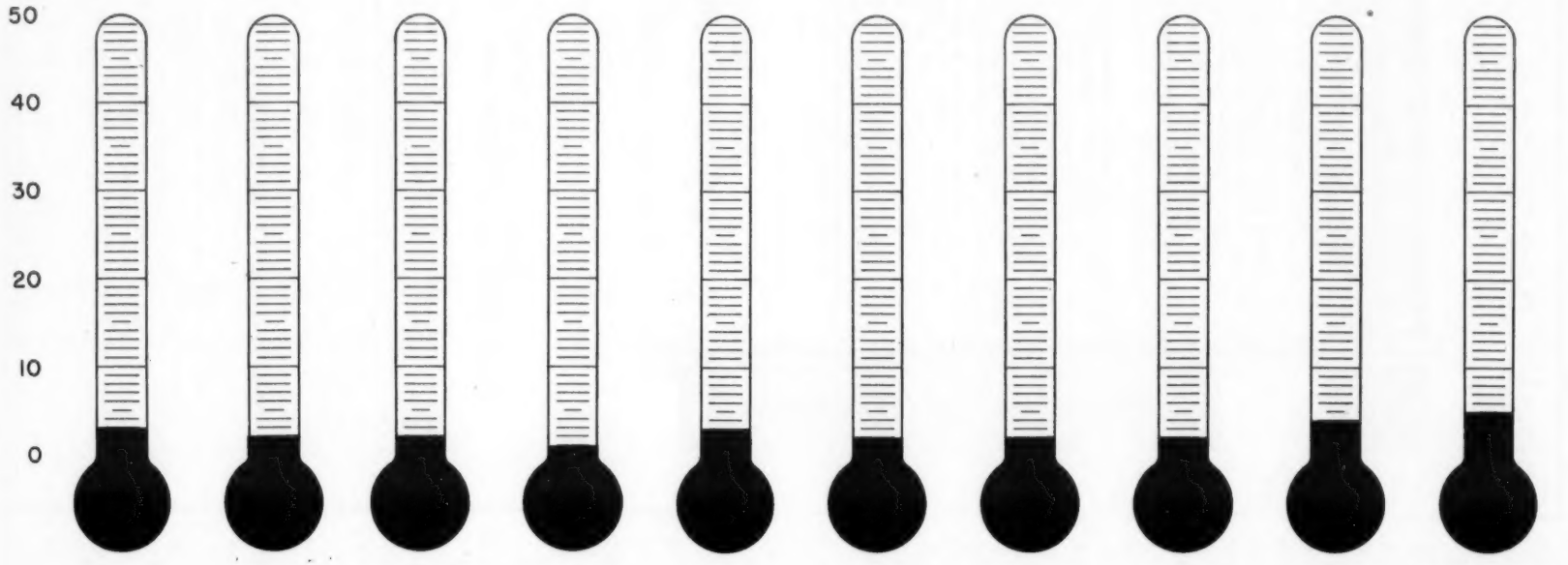
Consisting of general and concurrent workshop sessions, the conference will include discussion of automeasurement, long-range cost forecasts, capital budgeting, organization and operation of a cost control department, capital expenditures for equipment, electronic programming of costs, standards engineering of labor and material costs, obsolescence and MAPI formula, methods engineering and costs, leasing vs. buying, operations research, commercial engineering and distribution costs, management audits, cost control reports, cost sheets, and charts and graphs.

The conference will be held in cooperation with the Chicago Technical Societies Council, the Council for Technological Advancement, Illinois Manufacturers Association, Industrial Management Society, Illinois Manufacturers Costs Association, Institute of Management Sciences, Machinery and Allied Products Institute, National Institute of Commercial Engineering, and the Chicago chapters of the American Institute of Industrial Engineers, American Society of Tool Engineers, Controllers Institute of America, National Association of Cost Accountants, Operations Research Society of America, and Society for the Advancement of Management.

WESTERN SOCIETY OF ENGINEERS

MEMBERSHIP DRIVE
1956-1957

EXECUTIVE COMMITTEES — ENGINEERING SECTIONS



BRIDGE & STRUCTURAL	CHEMICAL & METALLURGICAL	COMMUNICATIONS	ELECTRICAL	FIRE PROTECTION & SAFETY	GAS, FUELS & COMBUSTION	HYDRAULIC, SANITARY & MUNICIPAL	MECHANICAL	TRAFFIC ENGINEERING & CITY PLANNING	TRANSPORTATION
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HALF A MEMBER FOR EVERY MEMBER

26
New Applications (To October 26)

The Following Members Have Obtained New Members

E. B. Buster
J. P. Gnaedinger
L. M. Gutgsell
K. C. Hudson
J. E. Linden
R. C. Meissner (Two)
H. R. Miller
F. Olearnik
E. H. Pratscher
S. R. Price, Jr.
L. N. Rian
J. H. Rohlf (Two)
W. B. Salzman
E. A. Schmidt (Two)
V. E. Staff
D. A. Sullivan
B. Woloshin

We Want 1000 New Members!

Most of you have probably received your pocket envelope containing the five business reply cards by this time.

Take it out of your pocket now and see how easy it will be for you to obtain new members in Western Society of Engineers.

First of all, turn to the side showing the requirements for membership. Here, in a brief outline, you are able to tell at a glance what qualifications the individual must have to become an Affiliate, Associate, Student, or Full Member. Remember, when telling someone that he or she appears to be qualified for a certain grade of membership, the final decision of the eligibility and status of the prospective member will be determined by the Admissions Committee. At least you are able to give him a fairly accurate idea of his potential status.

Now turn over to the other side of the envelope and show him how he might *save money by joining now!* If he belongs to another engineering or technical society he may become a member of W. S. E. without paying the entrance fee! He can actually save over 40% of the usual cost of becoming a member. That alone should encourage him to *join now*.

While you are still in the process of convincing him to become a member, glance down to the reminders which are listed below as an aid to assist you in selling that person on becoming a member of W. S. E. Surely you can discuss at great length the wonderful facilities, the interesting and informative programs, and the many benefits available to all members of W. S. E.

As a finale, to show *you* how easy it is for you to enroll this prospective candidate for membership—reach into the envelope — withdraw one of the cards — jot down his name and address — slip the card into the mail-box — and the W. S. E. office will handle the rest. It is as simple as that!

Stop and consider how many prospective members you know and give them the opportunity to become a member in a fine engineering society by sending in their names.

Yours in a successful membership drive,
Jack H. Rohlf, chairman

Engineering for Mobility

(Continued from Page 5)

great powers to reorganize and rebuild, shift and substitute, and swiftly transfer focuses of effort from stricken areas to those more capable of carrying on the struggle. In other words, I believe that flexibility and mobility — construction power and transportation power — are absolutely vital factors in national survival—more so in this atomic age than ever before.

Thus the close bond of interest that has always linked the Army, including the Army Engineers, with the national railway industry is stronger today than ever.

Though we must realistically prepare for it, we all hope and pray that war will never come. But last year it was brought home to us very forcibly that war is by no means the only disaster that can happen to a region or a nation. Great floods occurred within a few months of each other at opposite sides of the country, in New England and in California. I visited both flood areas, and I can testify that the destruction in New England, at least, reminded me of the havoc I saw after World War II. As a result of those disasters, the Federal Civil Defense Administration—which is the agency entrusted with coordinating Federal disaster-relief activities—along with other agencies, is studying ways of better preparing to meet similar disasters in the future. Among other things being considered are the roles to be played by each agency and level of government, the relief and restoration resources available to each, and methods of mobilizing them in a quick and orderly manner.

In case of natural disaster, as in the case of war, the railroads move up from the "necessary" category to the "vital." Railways are needed not only to bring the necessities of existence to the suffering people, but to make possible the swift assembly of the countless tons of equipment and material essential to the rescue and rehabilitation effort. Hence, one of our first tasks in any disaster is always to restore rail transportation and other communications facilities.

The Corps of Engineers has, for well over 125 years, been charged with the Federal responsibility for many aspects of our water resources development. Originally the Federal interest was only in connection with the improvement of our rivers and harbors. More recently it has included flood control and related functions such as the incidental development of hydro-electric power and provision for municipal and industrial water supply. We Army Engineers have, over this long span of years, studied hundreds of various civil works projects, from the improvement of small coastal harbors-of-refuge to the comprehensive development of our greatest river systems.

These projects have been initiated by people in the local areas who, speaking through their members of Congress, have requested the Corps to investigate the feasibility of solving their water problems. When thorough engineering and economic investigation by the Corps has indicated a solution in which conservatively anticipated benefits will exceed the carefully estimated costs, the projects have been recommended to the Congress. Throughout the years almost 55% of the vast number of projects that have been studied by the Corps have *not* been favorably recommended. This was because an objective analysis indicated that, at least at that time, the benefit-cost ratio was not greater than unity.

The other 45% of the projects, that have been favorably recommended by the chief of engineers, are required by our established procedures to be submitted twice for review, analysis and consideration by both houses of Congress. Favorable action is necessary first to authorize the projects as eligible for Federal paticipation—and second to appropriate money for construction. Scrupulous adherence to high technical standards and strict conformance to prescribed legislative processes has resulted in the Corps' civil works program being recognized as making a real and substantial contribution to the safety and economic prosperity of the nation. The program has survived and progressed through depression, war and all the storms and upheavals that have shaken the nation, regardless of which political party was in power. When the second Hoover Commission submitted its report last June (1955), they said "The Corps of Engineers has an enviable record for safe and adequate engineering design. It has demonstrated its ability to carry out very large engineering projects and it has been signally free of any taint of fraud or dishonesty in the administration of the vast construction program with which it has been entrusted."

The national program for flood protection is, however, only well begun. As our country becomes more crowded and busy with industries producing goods essential to national growth and defense, the necessity of reliable and secure transportation to serve the industrial complex becomes ever greater. And I believe we may well give greater thought to the *prevention* of flood damage to railroads. I believe that the railways, and particularly you railway engineers, can play an important part in better program for river-valley safety.

From bitter experience, you know as well as we do that the thousands of miles of railroads that parallel our mighty rivers and criss-cross their broad valleys

are too often "sitting ducks" when uncontrolled floods are rampant. It is, of course, economically absurd to suggest removing all these railroads from the flood plain or raising them above the level of possible flood damage. However, it is only good common sense to reduce flood risks as rapidly as possible by building soundly conceived and adequately designed flood control projects.

In some cases this can be accomplished by reservoirs—and this almost inevitably involves relocation of some rail facilities. In other cases levees, floodwalls, or channel rectification is the appropriate solution — and again tracks, bridges, switch yards and railroad stations are often involved. In dealing with these problems, we engineers are called upon to find acceptable answers — you for the stockholders, we for the public. Finding such answers has not been easy in the past and I can assure you it will be more difficult in the future. But if American engineers were stopped by difficulty, we would not only have no railroads, we would have no America.

The watchword "keep 'em moving" is virtually as important to our economy as it is on the battlefield. We must neglect no steps that may help preserve the intricate flow of goods and services which sustains our civilization, in all circumstances and through all crises.

The Corps of Engineers shares this responsibility with you because of our responsibility for the nation's navigable waterways. Our connection with waterways has led many people to feel that we are competitors of the railways and are identified with interests adverse to the railways. But in my view, railways, waterways, highways and airways are all indispensable parts of the national transportation system, and the national interest requires all to be in a healthy and thriving condition. For every headlined occasion when railways and waterway interests conflict, there are dozens of unnoticed occasions when their interests coincide and complement and mutually reinforce each other. It has been demonstrated time and again — at Houston, at Kansas City, on the Ohio, along the Gulf—that water transportation tremendously stimulates industry, commerce, and trade in the region it serves, and the railways share abundantly in the business thus built up.

The requirements of transportation, industry, the Armed Forces, the consuming public, and the many other vital elements of national life keep changing, and each must somehow manage to keep in step, in interlocking operation, with all the rest. This requires an immense, ever-alert cooperativeness which must pervade all our efforts and relations with one another. With the Corps and the railways each respecting the competence, the needs, and the missions of the other, we can provide an example of mutual assistance on the one hand and mutual reliance on the other which is typical of the interdependence of all elements of our unified, democratic nation. I submit that we must strive to enhance our cooperation — in fact, keep ourselves prepared for the closest integration of effort in case of emergency. Only in this way can we fully discharge our joint responsibilities to the nation's future—whether it is to bring us the peaceful advantages of atom-powered trains, or the holocaust of atomic warfare.

Solar Symposium Is Slated by AASE

The Association for Applied Solar Energy, in conjunction with Stanford Research Institute, Arizona State College at Tempe and the University of Arizona, will sponsor a two-day symposium on solar furnace design and construction.

The symposium, with the theme "Today's Tool for Tomorrow's Research," will take place Jan. 21-22, 1957, at the Hotel Westward Ho, Phoenix. It is being organized to bring American industry and governmental agencies the latest information on the part solar furnaces will be playing in the study of materials at very high temperatures.

Association president Jan Oostermeyer has announced that the sessions will include an address by Dr. C. C. Furnas, assistant secretary of defense for research and development and president-on-leave of the University of Buffalo.

Three technical sessions are to be held: "Design and Operation of Large Solar Furnaces," "Small Solar Furnaces for Basic and Applied Research" and "Furnace Performance Determination and Control."

As part of the program, symposium delegates will visit the solar furnace at Arizona State College on Jan. 22.

The symposium is being planned to attract representatives of industry and governmental agencies interested in problems related to high temperatures, such as thermal shock and materials for missiles.

Structural Engineering Conference Planned

The Civil Engineering Department of the University of Illinois, in cooperation with the Division of University Extension, announces the Fourth Illinois Structural Engineering Conference to be held December 3, 4, 5, 1956. Individual sessions will be devoted to a discussion of: Concrete Specifications, Steel Specifications, Foundations for Single Story Buildings and High-Strength Structural Steel. Printed programs may be obtained from R. K. Newton, supervisor of engineering Extension, 116 Illini Hall, University of Illinois, Urbana, Illinois.

Device May Solve a Jet Problem

The critical problem of moving giant civil jet transport aircraft near passenger terminal buildings at airports may be solved through use of a device presented in Miami, Fla., on Oct. 9 to airline technical experts by a Stamford, Connecticut, manufacturer.

A committee representing the Air Transport Association of America was shown a model of a wheel mover unit which can be attached to the main landing gear of jets like the Boeing 707 and Douglas DC8. With a pair of wheel movers attached, the pilot of the jet can shut off his noise, flame, and heat producing main engines and taxi the aircraft close to the terminal building to discharge passengers and cargo.

With jet transports scheduled for airline use within three years, the industry has been wrestling with the problem of taxiing the aircraft to normal ramp positions while protecting people and terminal facilities against the noise and blast of the jet engines.

The wheel mover unit, according to Consolidated Diesel Electric Corporation of Stamford, which developed it, will permit the aircraft to move from the edge of the ramp to the passenger discharge point at speeds up to five miles per hour and under complete control of the pilot. This eliminates objectionable features of towing a heavy aircraft, including strain on the landing nose gear, and, generally, poor control of the aircraft being towed. It also eliminates the requirements for a bulky, heavy and expensive tractor towing device.

The Con Diesel wheel mover unit is used in conjunction with, and receives its power from a mobile unit which also contains facilities for complete power servicing of jet aircraft while it is loading and unloading passengers and cargo.

This new concept in ground operation of jet aircraft was outlined to airline technical specialists by Paul Mitchell and A. J. Lirot, of Con Diesel's Aircraft Equipment Division. The presentation was a feature of the second session of a four-day conference convened in Miami by the Air Transport Association of America's ground equipment and maintenance facilities sub-committee.

The wheel mover unit itself is small in size, weighs only about 100 pounds, and is designed to be operated by one man. It is used in pairs, one to each main gear.

In his presentation Mitchell forecast that with the advent of jet aircraft transportation at major base terminals, it may be necessary to cut an incoming jet's engines at the edge of the congested ramp area and move the aircraft to the passenger loading fingers, and thereafter, on departure, to move away from the fingers to the edge of the ramp for outbound flight engine starting.

In actual operation, therefore, incoming flights would be met at the edge of the ramp by the mobile power-wheel mover vehicle. The wheel mover units would be quickly attached to the aircraft main gear and control power made available to the cockpit. Next, the mobile power unit would lift itself by simple hydraulic hook-up device to the belly of the aircraft. Thus with wheel movers attached and power emanating from the mobile power unit, the pilot would taxi the airplane at normal ramp speeds. Radio contact would be maintained continuously between the pilot and the airport's "ground control" operator. The pilot would be able to dock the aircraft by precise inching control.

While the aircraft was being offloaded and serviced and subsequent passengers and baggage on-loaded, the mobile power unit would be supplying the required 400 cycle AC power. For the departure flight, the pilot could either back away from the dock or proceed forward according to conditions at hand and move at normal taxi speeds to the edge of the ramp where the aircraft jet engines would be started. The operator of the mobile power-wheel mover vehicle would then disconnect the wheel mover units and return at normal driving speeds to the edge of the ramp area where he would pick up the next incoming flight.

The mobile power unit is built with a low silhouette to minimize the possibility of collision damage to aircraft, and contains an industrial type gasoline engine for trouble-free operation. Components in the unit have been thoroughly tested in the course of their actual use over a period of years in literally hundreds of military jet aircraft ground support units, which Con Diesel has furnished under contract to the Armed Forces.

The wheel mover unit will fit any aircraft with little modification and will give zero radius turns, with one main gear moved forward while the other is moved rearward.

Mitchell noted that use of separate but inter-related units, such as the wheel mover and mobile power units, offer greater versatility and growth potential than a combined unit, or the static structure afforded by a fixed underground power supply.

Economy of operation is paramount with the wheel mover unit because of its separation from the power unit. Since study of airport operations indicates that four power units are needed to service standing aircraft for every aircraft moving unit, maximum utilization of equipment may be obtained by purchasing in this 4 to 1 ratio.

The inter-related wheel mover and mobile power units represent the latest development in a long-range study by Con Diesel of jet aircraft ground sup-

port requirements for both commercial and military establishments.

Con Diesel, with main plant facilities in Stamford, Connecticut, has produced over 2,500 mobile power units in 14 different configurations for support of jet aircraft for air frame manufacturers and the Armed Forces.

Porcelain Enamel Panel Use Increases

The use of porcelain enamel panels in construction has increased tenfold since World War II, a group of 40 architects, artists and students was told by Doris Hall and Kalman Kubinyi, art directors of The Bettinger Corporation, Waltham, Mass.

The most obvious result of this increase, Hall and Kubinyi said, is that modern buildings show greater use of color, both inside and out.

The discussion of porcelain enamel techniques was part of a summer course given by the Department of Architecture of the Massachusetts Intitute of Technology. A highlight of the course was a visit to the Bettinger plant and an opportunity to see the Hall-Kubinyi teamwork at work. Bettinger is considered one of the nation's leading producers of porcelain enamel panels and other ceramic-on-steel products.

Porcelain is a glass-composite material which is fused to metal. It is durable, reflects light and heat, is color fast, has insulating properties and is strongly resistant to abrasion and most acids and salts, the art directors explained.

Because of these properties, they said, porcelain enamel is being used for coatings on such widely different objects as curved roofs, diamond-shaped steel trusses, curtain walls, plain and acoustical panels, coping, ventilating louvers, and window frames and sills.

Miss Hall told the group that one of the most popular uses of porcelain has been for murals. The murals solve many of the decorating problems of modern architecture. They can be used both on interiors and exteriors and range in size from small decorations to whole-wall murals.

Miss Hall's mural "Daphnephoria" won the Architectural League's Silver Medal Award for 1953. Other murals by her are on display in well-known museums.

CRERAR LIBRARY
News and Notes

Members of WSE have probably noted the new faces in Crerar's Technology Department. William S. Budington, Associate Librarian, who has general charge of public services, now has Mr. Richard A. Davis as his principal aide in Technology. Mr. Davis's academic and professional education was received at Pasadena Junior College, the University of California and University of Chicago. Before coming to Crerar he had several years editorial experience with the Farmer's Weekly Review in Joliet and later served as purchasing agent for Bio-Process Company, also in Joliet. He served in World War II in the Navy where he completed flight training and instructor training. Subsequent to the war he served as maintenance officer for a year in the Navy air corps, and he is now Lieutenant Commander USNR.

Other new reference librarians in the Technology Department are Mr. Marjan Merala and Miss Ann Carolyn Roess. Mr. Merala studied at Classical College, Ljubljana, Yugoslavia; the University of Bologna; the University of Madrid (from which he obtained a Licentiate in Veterinary Medicine); and the University of Illinois, where he completed work for his library science degree. Prior to his studies at the University of Illinois, he had experience as a tool maker with Imperial Brass Mfg. Co. in Chicago. Miss Roess has a degree in science from Pennsylvania State University and in library science from Simmons College. Prior to joining the Crerar staff, she was with the Texas Company in Beacon, N.Y., where she served as a trainee in the chemistry laboratory and as physicist in the technical library.

From time to time, literature scientists Emmett McGeever, Roger Martin and Ammiel Prochovnick of the Research Information Service staff also assist in the Technology Department.

* * *

One of the important fields of Crerar service is assistance to students of the technical and professional schools of the region. Occasionally, special groups of students make visits for instruction and advice on the resources of Crerar and their use. Examples are scheduled visits in early November of forty students from the Chicago Technical College, who will use the Library in connection with a group design problem, and another group of students from the University of Illinois Medical School, who will view some of the treasures of the medical collections and receive instruction in use of the Library.

* * *

During November and December, Mr. Asok Kumar Mukherjee of Calcutta, India, will serve as an intern in Crerar Library under auspices of the U. S. Department of State and the American Library Association. Mr. Mukherjee was trained as a mathematician and is a graduate of the school of librarianship in Calcutta. He has served, since 1950, as assistant librarian of the Indian Institute of Technology in Calcutta.

Air Force Academy Has Water System

Completion of the portable water system for the Air Force Academy at Colorado Springs, Colo., was announced by Col. A. E. Stoltz, director of the Air Force Academy Construction Agency.

Col. Stoltz said that the pipeline system, built under a $399, 235 contract with Wade Lahar Construction Company, Tulsa, has been accepted by the Agency. It is the second major construction contract completed, the first being for the sanitary sewage system.

The Wade Lahar contract was awarded on Aug. 19, 1955, and has been completed for several weeks with the exception of testing and minor adjustments to certain mechanical valves. It included some 38,000 feet of pipeline, in varying sizes of steel water pipe and cast iron pipe.

Also a part of the job was the construction of a 390-foot tunnel through the Rampart Range, which carried the pipeline from the city's water supply system. Under agreement with the city of Colorado Springs, the Air Force Academy is guaranteed a maximum of five million gallons of water daily, although Air Force authorities anticipate that quantity will not be needed for ordinary usage.

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Midwest Research Breaks for Coffee

Midwest Research Institute, Kansas City, Mo., has perhaps the nation's most unusual afternoon coffee break: some 200 members of the staff have a light snack of irradiated foods.

It's all perfectly safe, and in the interests of science, too. The objective is to find chemical additives which might protect against flavor damage taking place during radiation sterilization.

Preliminary results were reported Sept. 17 in a paper presented at a Symposium on Radiation Sterilization, sponsored by the Division of Agricultural and Food Chemistry of the American Chemical Society at the ACS's 130th National Meeting in Atlantic City, N.J.

Dr. Robert W. Shortridge, William H. Burton, Betty Lou Scott, and Shirley Fry were authors of the paper, "The Effect of Chemical Additives Upon Odor and Taste Changes Caused by Radiation Sterilization." It was a progress report on studies at Midwest Research, one of a number of institutions conducting foods irradiation work under sponsorship of the Quartermaster Food and Container Institute, U.S. Army.

As is well known, irradiated food will keep almost indefinitely without refrigeration, and the process is therefore of great interest for military applications. Unfortunately, irradiation changes the flavor of some foods.

"Our purpose in the present phase of this work was to simulate actual use conditions of the foods in question as closely as we could," the Midwest group reported. "To this end we abandoned use of our small trained taste panel and began using the entire staff of the institute as a large, untrained panel."

Four foods — hamburger, haddock, corn, and lima beans—were selected for this phase of the studies. Samples of the foods were treated with chemical additives, frozen, and shipped by air express to the Materials Testing Reactor at Arco, Idaho, for gamma irradiation. Upon return by air express, they were thawed and then cooked in as appetizing a manner as possible, with proper seasoning.

The home economists carried the food specimens by cart to large groups of employees, who sampled them and gave their opinions without leaving their desks or laboratory benches. Although a small, professional taste panel is used for certain tests, the unskilled tasters were asked only "Which of these two samples do you prefer?"

Dr. Shortridge and his associates emphasized that their paper was in the nature of a progress report, and that no hard-and-fast conclusions could be drawn from the data. They added:

"While we ourselves have not yet found any additive with a dramatically beneficial effect upon irradiation flavor, we have found some in our preliminary odor tests with definite effects, and our main series of tests has little more than begun."

Army of Punks Work On Mackinac Bridge

Cable spinning on the huge Mackinac Bridge brings a small army of young "punks" to the job. They are apprentice bridgemen and are so-named by veteran bridgeworkers because their job is known as "punking."

Stationed at intervals on the two catwalks which run from anchorage to anchorage over the twin 552 foot towers, the "punks" help set and guide wires during cable spinning operations. High above the Straits of Mackinac, they have the most spectacular view in the area.

Before "punks" can begin work, they undergo a thorough physical examination. Then, they receive instruction on safe working practices by Walt Clasen, Mackinac Bridge safety engineer for U. S. Steel's American Bridge Division.

"The first day is always an occasion," says Clasen, who had just put 78 young men on the job. "It's something like a solo for an air cadet."

A punk's post is at one of 14 stations on each catwalk. There, with a foreman nearby and in a crew that includes a qualified bridgeman, he helps to set and keep straight the parallel wires which makes up the 24½ inch cable.

Dan Kline, the bridge project manager for American Bridge, estimates that there is about one apprentice to every journeyman engaged in cable spinning operations. For many of these young men, "punking" is the start of a career which in two or more years can qualify them as bridgemen.

Spinning of the Mackinac Bridge's two main cables by crews of American Bridge Division began in mid-July and is now well over a third completed. Each of the giant cables will be made up of 12,580 wires—a total length of 41,000 miles. Wire used is about the size of a lead pencil.

A tramway rope moving above the catwalks hauls two spinning wheels in opposite directions from anchorage to anchorage. Wire from reels on one anchorage is looped around the rim of the wheels and carried over the towers to the other anchorage where it is locked in place with other wires making up the cables. As wire is carried along the catwalks it is set parallel into place. No twisting or braiding of wire is involved.

When finished late in 1957 for the Mackinac Bridge Authority, the bridge will span the Straits of Mackinac, joining the upper and lower peninsulas of Michigan with a modern four-lane highway.

Reviews of Technical Books

Foundations

The Design and Construction of Engineering Foundations, by F. D. C. Henry, McGraw-Hill Book Company, Inc., New York 36, N.Y. 1956. 547 pages. $9.00.

Practicing engineers or students of engineering will find this book a valuable reference work, for it combines engineering geology, soil mechanics, and the theory and design of structures.

Henry, who is a civil engineer with experience in engineering geology in both Great Britain and the United States, states that his object is "to sow the seeds of ideas by linking the design of foundations to the methods of structural analysis and soil mechanics, by indicating how other engineers have constructed foundations, and by examining the whole subject in the light of relevant research."

Some of the recent advances are: Richart's work on pad footings, Rowe's work on lateral pressures on bulkheads, and Terzaghi's work on the design of cellular cofferdams. In a separate appendix there are one hundred design problems in planning, analysis, and detailing of foundations. Throughout the text the fundamental principles and practical applications of this branch of engineering science have been stressed.

R.G.G.

Computer Techniques

Analog Computer Techniques, by Clarence L. Johnson. McGraw-Hill Book Company, Inc., New York 36, N.Y. 1956. 264 pages. $6.00.

Since many of the rapid advances in the field of automation have been aided by the use of a tool known as the electronic analog computer (or electronic differential analyzer), this text has been written to help the computer operator.

Captain Johnson explains that the rapid development and accepted use of this new tool inspired the preparation of this book; this material has been used in computer courses taught at the U.S. Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio. His aim is to direct the student toward actual investigation of his problem rather than to stress learning to use the computer. He does this by including specific techniques for the solution of difficult problems.

However, the material is presented, wherever possible, so that even a student with a limited knowledge of mathematics and electronics is able to comprehend the techniques and principles. Problems at the end of each chapter are a check on the student's factual understanding of the subject. The use of diodes and differential relays in analog computation: function generating techniques including methods of representing functions of more than one variable; repetitive analog computers; and the principles of operation of the digital differential analyzer type equipment are also included.

R.G.G.

Irrigation Engineering

Irrigation Engineering, Volume II, by Ivan E. Houk, John Wiley & Sons, Inc., New York, N.Y. 1956. 531 pages. $14.00.

This book, the second of two volumes on irrigation engineering, deals primarily with large gravity irrigation projects and their auxiliary storage systems. (The first volume discusses the agricultural and hydrological phases of irrigation.)

Houk, a consulting engineer in Denver who has had over forty years' experience in the engineering field, has planned this material to meet the needs of engineering students and young irrigation engineers. He emphasizes the practical requirements that must be kept in mind in evaluating irrigation feasibilities, planning irrigation projects, designing irrigation features, and constructing irrigation systems.

The material is a compilation of articles on federal irrigation projects and technical articles, as well as important information from the author's own wide experience in this field. For most of his career was spent with the Bureau of Reclamation of the U.S. Department of the Interior. There he prepared technical studies for the design and construction of Hoover, Grand Coulee, Shasta and Friant dams. Consequently, this text gives a complete picture of modern irrigation engineering.

R.G.G.

Math for Electronics

Mathematics for Electronics with Applications, by Henry M. Nodelman and Frederick W. Smith, McGraw-Hill Book Company, Inc., New York 36, N.Y. 1956. 391 pages. $7.00.

In this mathematics text, the emphasis is placed on application rather than on mathematical theory. This is an outgrowth of the authors' many years experience in the teaching of mathematics to students of electronic engineering and in engineering practice.

Nodelman and Smith feel that the barrier, which exists between mathematics and its applications, can be overcome by demonstrating the practical uses which industry makes of mathematics. In this text, they offer a complete set of up-to-date problems based on current engineering practice, the result of more than five years of research in the technical literature.

This book is written for students who have a background of elementary calculus, physics, and elementary electrical network theory. It may be used in industry, as well as in undergraduate technical institute and engineering college courses in applied mathematics, networks, transients, and nonlinear systems. Mathematical applications are accompanied by completely worked out examples and are extensively supported with references. Thus the student may supplement his knowledge of the problem by referring to the original article from which the problem was taken.

R.G.G.

Hoover Medal Goes to Hoover

The Hoover Medal for 1956, one of the engineering profession's most distinguished honors, has been voted to Herbert Hoover, Jr., under secretary of state.

The Hoover Medal was named after former President Hoover, HMWSE, father of the Under Secretary and, in 1930, its first recipient. It was awarded then, as it has been through the years since, "by engineers to a fellow engineer for distinguished public service." It is sponsored by four major engineering organizations, the American Society of Civil Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. These are known, generally, as the Four Founder Societies.

Announcement that Herbert Hoover, Jr., had been named by the Hoover Medal Board of Award, consisting of three representatives of each of the four organizations, was made in New York City by the Board's chairman, Scott Turner. Dr. Turner is a Past President of the American Institute of Mining, Metallurgical, and Petroleum Engineers, and a former Director of the U. S. Bureau of Mines.

Time and place of the presentation to Under Secretary Hoover will be announced later. The ceremony will be under direct sponsorship of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), of which he has been a member since 1937. Former President Hoover is senior past president of AIME. He was president of the Institute in 1920. He joined the Institute in 1896. In 1917, the Board of Directors elected him an honorary member, highest distinction in AIME. His achievements in mining led to his receiving the William Lawrence Saunders Gold Medal in 1928. The former President is, also, a member of the Institute's Legion of Honor, denoting membership of at least fifty years.

The Hoover Medal foundation was established in 1929. A statement by the Board of Award relates it was created "to honor engineers whose pre-eminent services have advanced the well-being of mankind and whose talents have been devoted to the development of a richer and more enduring civilization" and that "the engineering societies award the Hoover Medal in recognition and appreciation of those principles and ideals of civic obligation and of public service exemplified by the life and work of Herbert Hoover."

This is the first time in the 86-year-old history of the 26,000-member AIME that there has been a father-and-son achievement of so high an award. The younger Hoover's career has been largely in the field of petroleum geophysics. He was graduated from Stanford University in 1925 with the degree of Bachelor of Arts. He received from Harvard in 1928 the degree of Master of Business Administration. He had a teaching fellowship at California Institute of Technology, of which he later became a Trustee.

His interest in geophysics grew out of his airlines engineering activities in the West. Herbert Hoover, Jr., became president of United Geophysical Corp., of Pasedena, Calif. in 1935, and later became chairman of the Board. He divested himself of all business interests several years ago when he undertook the assignments in foreign relations that led to his appointment as under secretary of state. He has contributed to the AIME Technical papers of geophysics; he is a member of the American Association of Petroleum Geologists, and of the Society of Exploration Geophysicists.

The Hoover Medal which Herbert Hoover, Jr., will receive, is gold. On one side it bears a profile of his father. On the other it is described as an "award by engineers to a fellow engineer for distinguished public service."

Power Source?

Gas produced by burning coal underground may give England a cheap source of power plant fuel, according to *Electrical World*. The process may tap an estimated 500-million tons of United Kingdom coal now uneconomical to mine.

WSE Personals

Harold B. Gotaas, professor of sanitary engineering at the University of California (Berkeley), has been appointed dean of the Northwestern Technological Institute effective Feb. 1, 1957. The announcement was made by President J. Roscoe Miller.

Gotaas will remain at the University of California until midwinter to complete research he is conducting there. He will visit the Northwestern campus in the meantime to confer with the administration and faculty.

Ovid W. Eshbach, MWSE, will continue as acting dean of the Technological Institute until Gotaas assumes his new post.

Gotaas has been on the University of California faculty since 1946 where he has served as chairman of the division of civil engineering and irrigation and is presently directing the sanitary engineering laboratory. He also has served on the faculties of the University of South Dakota and the University of North Carolina and has been a consulting engineer and bridge designer.

* * *

Clinton A. Stone has been named supervisor of nuclear physics at Armour Research Foundation of Illinois Institute of Technology, Chicago.

In his capacity as supervisor, Stone will be responsible for all research based in the nuclear physics section, according to Dr. Leonard Reiffel, manager of the ARF physics research department.

This includes research in cosmic rays, nuclear instrumentation, nuclear spectroscopy, tracer techniques, radiation damage, and radiation effects.

Stone had been associated with the Foundation for six years before joining Convair, San Diego, in 1955 as senior thermodynamicist. He returned to ARF in September.

He has participated in research in the fields of aircraft nuclear propulsion, nuclear instrumentation, gamma ray spectroscopy, and neutron activation analysis.

Currently working toward a Ph.D. degree, Stone received his B.S. in engineering physics from Montana State College in 1949 and his M.S. from Illinois Institute of Technology in 1953.

* * *

John S. Holmes, president of the Warwick Manufacturing Corporation of Chicago recently announced the September 10, 1956 opening of a newly constructed research center. Warwick's suburban executive-engineering-research headquarters houses this new center which marks another step in the growth of Warwick within the consumer electronics field.

Edward S. White, Warwick's director of research is now staffing the new division.

* * *

Howard P. Hall, associate professor of civil engineering at the Northwestern Technological Institute, has been named dean of engineering at Robert College, Istanbul, Turkey.

His resignation from the Northwestern faculty was effective Sept. 8. He left immediately thereafter to assume his new post.

Robert College is an American-administered school offering liberal arts and engineering studies for Turkish students. Instruction is given in English.

Hall first joined the Northwestern faculty in 1939. During World War II he served with the United States Army Corps of Engineers. He rejoined the Northwestern faculty in 1946.

An authority on soil mechanics, Hall in 1955 headed a team of five technical experts studying airfield design and construction problems at bases in the United Kingdom for the United States Air Force. In 1951-52 he was associated with the United States airfield construction program in Morocco.

He holds three degrees in engineering from Harvard University, and was on the engineering faculty at Brown University prior to coming to Northwestern. He is a member of the American Society for Engineering Education, the American Society of Civil Engineers, and the American Geophysical Union.

Plastics Engineers Planning Conference

The St. Louis Section Conference Committee for the 13th Annual National Technical Conference of the Society of Plastics Engineers, Inc. has completed a major share of the work on the conference program, Otto Wulfert, general chairman, has announced.

The event will be held Jan. 16, 17, 18, 1957, at the Sheraton-Jefferson Hotel in downtown St. Louis and has as its theme, "Fifteen Years of Plastics Progress."

The Conference officially begins on Jan. 16, with technical sessions scheduled for mornings and afternoons Wednesday and Thursday with morning sessions on Friday.

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WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

15-56 Miss Helen M. Cannom, Draftswoman; DeLeuw, Cather & Co., 150 N. Wacker Dr.

16-57 Wm. Furber Smith, Engineer, Miller-Warden Associates, 300 W. Washington St.

17-56 Charles W. Harris, Jr., Senior Project Engineer, Armour & Company, 1355 W. 31st St.

18-56 Burt K. Preston, Assistant Chief Engineer, The Illinois State Toll Highway Commission, 20 N. Wacker Dr.

19-56 Robert A. Rehwaldt, Application Engineer, I-T-E Circuit Breaker Co., 105 W. Adams St.

30 Specialists Speak At Dynamics Meet

More than 30 specialists in jet and rocket engineering and allied fields spoke at the 1956-57 Gas Dynamics Colloquium sponsored by the department of mechanical engineering at the Northwestern Technological Institute.

The technical lectures were open free of charge to professional scientists and engineers and to educators and advanced students in the fields of physical science and engineering.

First lecture in the series was held Oct. 9, in the Technological Institute in Evanston, Ill. John Fenn, of the James Forrestal laboratory at Princeton University, discussed European research.

Other speakers and their topics during October were: Oct. 11, "Annular Two Phase Flow" by Howard McManus of the Northwestern mechanical engineering department; Oct. 18, "On a Class of Non-Steady Motions of a Real Fluid" by Harold De Groff, head of the graduate school of aeronautical engineering at Purdue University, and Oct. 25, "Several Applications of the Equations of Change" by R. B. Bird of the chemical engineering department at the University of Wisconsin.

High Heat Resistant Paint Is Developed

A new and unique high temperature resistant paint has been developed at the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va. Designed primarily for field application for the protection of diesel engine exhaust systems, it has proved to be even more satisfactory for plant application.

Senior project engineer, Emil J. York, states that the paint can be applied by either brush or spray and will air dry to handle within one hour. In its air-dried state, it provides excellent protection from rust and corrosion and after complete curing the protection afforded is unlimited.

The paint can be applied and cured in place by merely using the engine or it can be applied and cured immediately as in plant operation.

In tests conducted by a large manufacturer of heavy construction equipment the paint has remained in excellent condition after more than 18 months exposure at their proving grounds. Tests at the Engineer Laboratories show the paint to be in perfect condition after 1,200 hours exposure to temperatures in excess of 1400°F.

Major requirements for satisfactory performance are a clean and oil or grease-free surface, preferably blasted, and a controlled maximum dry film thickness of 2.5 mils.

A military specification is being prepared on this material and its use will be mandatory on Corps of Engineer equipment.

Air Pollution Problem Is International One

One area in the world with an even bigger national air pollution problem than in the U.S. is in the German Federal Republic, with an estimated dust fall-out of one million tons a year (106 tons per square mile), reports *Chemical Week*. Industry's lack of enthusiam for air pollution control stems from the fact that to provide all existing factory chimneys with filters would cost an estimated 50 billion Deutsche Mark (approximately $11.9 billion).

Haber Speaks on Highway Program

Much has been written of the impact of the Interstate System program on the nation's economy, the number of men to be employed and the materials and equipment to be purchased, but, the national convention of the American Society of Civil Engineers was told Oct. 18, "practically nothing has been said about the plans required before all this is a reality." And, added Richard A. Haber, chief engineer of the Delaware State Highway Department, "few writers seem to realize that work on the present highway system must continue and, in fact, increase as the Interstate System will change and influence the traffic pattern."

Highway engineers, however, "are well aware that plans come first and they are spending a lot of extra hours trying to develop methods of saving manpower and time in their preparation," continued Haber. He felt that "under the present pressures we seem to be in a position of getting quantity or quality, but seldom both," but added that "both can be attained by a process of simplification and both must be attained if we are to meet the demands and at the same time maintain our standing as a profession."

Haber stated that in many highway departments there exists an antagonism toward consulting engineers stemming from the time, "not so long ago, when most consultants were doing bridge and structure work and practically none was doing highway work." He commented that early plans by some consulting firms when they first took on highway work were by no means of high quality.

"The closed-mind attitude of many highway departments must be overcome and the consultant, with his work in other states, is in a position to present for consideration the best features of the work done in those other states," advised Haber in discussing recommendations made in highway planning.

Metal Mail Men

Mail handling may become mechanized, according to *Product Engineering*. Information on a letter would be transferred to a machine, where a memory device would know to what part of the country the letter should go.

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U.S. Transportation Is Lauded

"The America we know is the product of a combination of its resources, its people, its free political institutions, its competitive economic system — and its transportation," said William T. Faricy, president, Association of American Railroads, Washington, D.C., at the opening of the Transportation Center at Northwestern University, on Oct. 6 in Chicago. Faricy continued:

"This continent, vast and rich, was here before the people. The people came and achieved political and economic freedom. But the land, the people and the institutions of freedom, all these would not have been enough to produce the results we see all about us had it not been for the revolution in land transportation which came with the substitution of mechanical power for muscle power in the movement of persons and goods.

"This revolution began with railroads, and none of its results have been more profound and far reaching than those due to the use of the roads of rails. On these railroads thousands of tons of freight, or hundreds of passengers, are moved in a single train. These trains produce transportation with a minimum expenditure of manpower, fuel and materials. And the railroads sell their service at charges so low that even today, with all the war and post-war inflation of costs, the average revenue received for hauling a ton of freight one mile is less than 1½ cents.

"This continent-wide, low-cost freight service of the railroads is essential to the whole productive process in this land of vast production and long distances. Agriculture on the scale and of the type developed in this country would be impossible without this basic service of the railroads. The American industrial marvel of mass production and mass consumption depends on the low-cost, mass transportation which railroads supply. Even the other forms of transportation, valuable and useful as they are, could not have come into being and could not continue to exist today without the basic services rendered by the railroads. And in the defense of the nation railroads — which moved more than 90 per cent of all war freight and more than 97 per cent of all organized military travel in World War II— are absolutely vital.

"It is as the representative of these railroads that I am proud to participate in the inauguration of this Transportation Center at Northwestern University. The purpose of this Center is to bring to bear the study, research and training facilities of a great university upon the technological and economic problems involved in the whole field of transportation—whether it be by rail, by road, by water, by air, by pipeline, or by other ways and means not yet dreamed of.

"Such a purpose calls for study and research not only in the development of the potentialities of each single form of transportation but also in the intricate relations among the several forms, and the relations of the transportation industry as a whole with the public and with governmental authority.

"The impact of government—national state and local—on transportation in all its forms deserves particular study. Government is a huge user of transportation and is the regulator of much of its use by others. Government levies and collects taxes on transportation. Government, moreover, is active in promoting the development of some forms of transportation and government funds constitute the major source of investment in the facilities necessary for operation of those forms. Government, therefore, as user, regulator, taxer, promoter and investor, is a necessary part of any study of the transportation picture as a whole.

"Such a study requires recognition of the profound differences in the fundamental concepts on which the several forms of transportation are based. Our American railroads, both in their roadways and equipment, are almost wholly the product of private investment in the private enterprise way of doing business. In the case of most other forms of commercial transport, the private enterprise part of the business is confined to providing, maintaining and moving the vehicles, while public funds provide, maintain and improve the airways and airports, the rivers and canals, and streets.

"This fact gives rise to questions. Do such differences in the treatment of different forms of transportation at the hands of government tend to distort the transportation picture. To what extent do user charges, where they exist, tend to reimburse government for its expenditures made at least in part for the benefit of those who use public facilities for the commercial business of transportation. To the extent that user charges do not exist, or are inadequate, does this prevent ascertainment of the true real cost of transportation by the different modes.

"And so it is the hope of the railroad segment of this industry that the work of this Transportation Center will not be limited to the training of people for careers in transportation and to research in its technical aspects, important as those matters are. It is in the field of scientific study of such economic questions as I have tried to pose in the brief time allotted to me that such a Transportation Center as is launched here today may find its greatest usefulness not only to the transportation industry itself, but also to the nation which pays the bills."

A Thought

Many foxes grow grey, but few grow good. —Poor Richard's Almanack

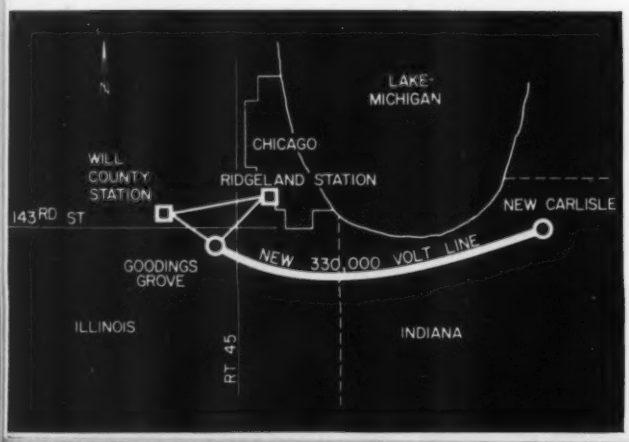
New 330,000 volt line to link 2 great systems

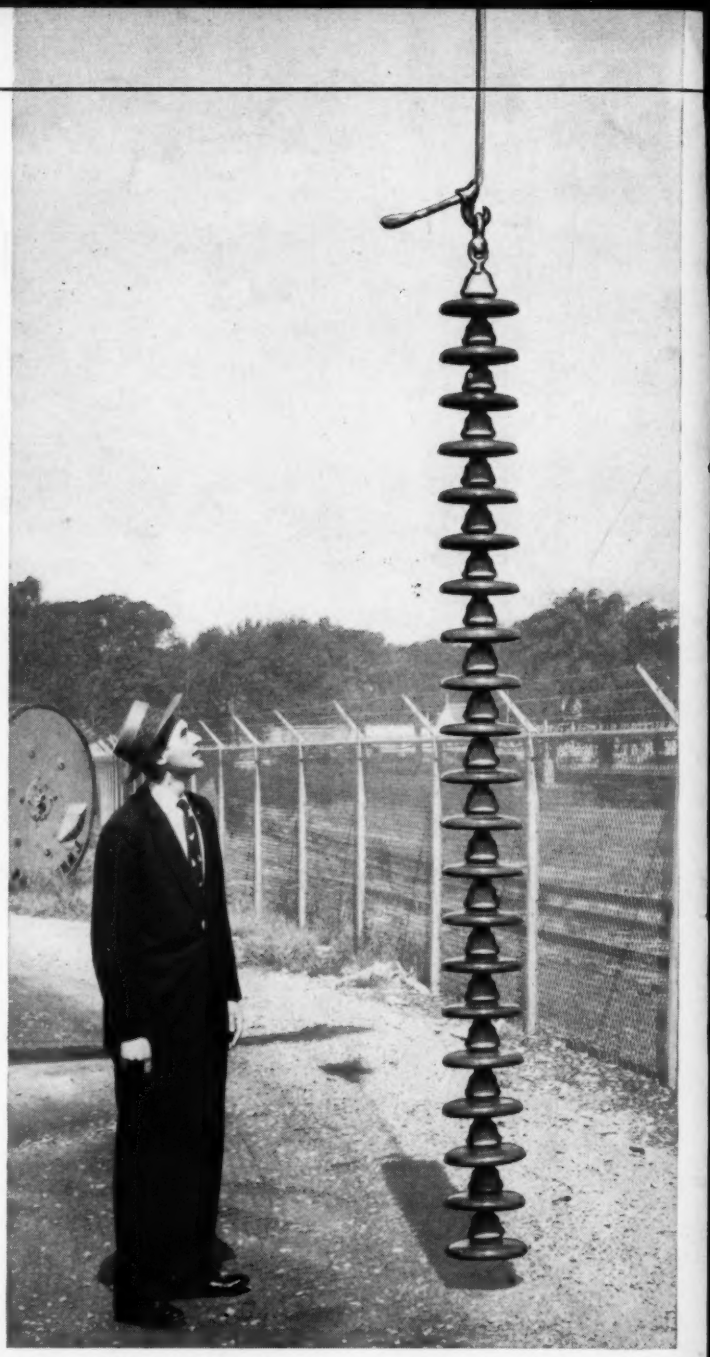
The Commonwealth Edison high voltage transmission system will soon be connected with that of the American Gas and Electric Company by means of a new extra high voltage transmission line which will operate at 330 kv, the highest operating voltage in the U. S. today. Construction of the 90-mile double circuit line (see map) will start next summer and will be completed in 1958.

The towers will vary from the height of about 150 feet to 200 feet and the conductor will be nearly 2 inches in diameter. The Goodings Grove terminal will contain two 50,000 kva synchronous condensers and two transformers to give the line an initial capacity of 300,000 kw. The line has possibilities of being increased to a capacity of 1,000,000 kw.

But with the advantages of EHV (extra high voltage) also go the problems of refining the technology in this relatively unexplored region. Although American Gas and Electric has used 330 kv transmission for several years, Commonwealth Edison and A.G.E. engineers encountered many new problems in designing the new line. And they are quick to admit that there is still much to be learned about EHV. But the challenges it presents today's engineers will help solve many of tomorrow's tough transmission jobs.

This is another example of how Edison engineers are helping stay ahead by providing the most reliable service consistent with good operating economics for the 6,000,000 people in Northern Illinois.





Engineer Ed Koncel (who worked on various aspects of the 330 kv line) finds his 6 ft. 4 inches dwarfed by string of insulators used in line's construction.

The line will provide large capacity mutual emergency and standby assistance between the two great systems. Both Commonwealth Edison and American Gas and Electric will have about 5,000,000 kilowatts of generating capacity by the time the line is completed.

Commonwealth Edison
AND
Public Service Company

Pioneers in progress for over 69 years